

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended): A method for detecting a high impedance fault ~~faults~~ fault in an electrical power lines ~~line~~ comprising:

providing a plurality of high impedance fault detection means ~~each having an~~ output;

providing a decision means;

~~independently detecting a high impedance fault condition in said electrical power lines using said plurality of high impedance fault detection means~~ to make a plurality of independent determinations whether said high impedance fault has occurred, respectively;

generating outputs representative of said independent determinations; and

~~determining a presence of a high impedance fault using a~~ said decision means to determine whether said high impedance fault has occurred, wherein said decision means determines that said a high impedance fault has occurred if any two or more of said independent outputs are indicative ~~that an associated one of said plurality of high fault detection means has detected a~~ indicate that said high impedance fault condition has occurred.

2. (Original). The method of claim 1 wherein said plurality of high impedance fault detection means are at least three.

3. (Currently Amended): The method of claim 1 wherein said plurality of high impedance fault detection means are at least three and each ~~provide a logical output having one state indicative that said associated one of said three detection means has detected a high impedance fault and said decision means is a decision logic and said method further comprises:~~ of said outputs has one of first and second logic states, said first logic state indicating the presence of said high impedance fault and said second

logic state indicating the absence of said high impedance fault; and

wherein said decision means ~~determining a high impedance fault if any two of~~
~~said three logical outputs are in a state indicative of detecting a high impedance fault~~
determines that said high impedance fault has occurred if any two or more of said
outputs have said first logic state.

Claim 4 (Canceled).

5. (Currently Amended). A system for detecting a high impedance faults fault in an electrical power system having an alternating current flowing therethrough comprising:

an electrical power supply;

one or more interconnected electrical power conductors; and

a composite high impedance fault detection system connected to said one or more electrical power conductors for detecting a said high impedance fault ~~when at least two of a plurality of individual high impedance fault detection systems each independently detect the occurrence of a high impedance fault on said electrical power conductors,~~ said composite high impedance fault detection system comprising:

a plurality of high impedance fault detection systems operable to
respectively make a plurality of independent determinations whether said
high impedance fault has occurred and to respectively generate outputs
representative of said independent determinations; and

decision means connected to said high impedance fault detection
systems for determining whether said high impedance fault has occurred,
said decision means determining that said high impedance fault has
occurred if any two or more of said outputs indicate that said high
impedance fault has occurred.

6. (Currently Amended). The system of claim 5, wherein said plurality of ~~independent individual~~ high impedance fault detection systems ~~further~~ comprise:

a wavelet based system ~~having a first logical output for detecting a high impedance fault condition in said electrical power line;~~

~~a higher order statistics based system having a second logical output for detecting a high impedance fault condition in said electrical power line; and~~

~~a neural network based system having a third logical output for detecting a high impedance fault condition in said electrical power line;~~

~~said wavelet based system, said higher order statistics based system and said neural network based system each independently detecting the same high impedance fault condition in said electrical power lines.~~

7. (Canceled).

8. (Original). The system of claim 5, further comprising a sensing device coupled to one or more of said one or more electrical power conductors for sensing current flow on said conductors and a bandpass filter disposed between said one or more of said sensing device and said composite high impedance fault detection system.

9. (Currently Amended): The system of claim 5, further comprising ~~one or more processors that receives and processes data indicative of current flow on said one or more electrical power conductors from said sensing device and logical outputs from each of said individual high impedance fault detection systems, and that determines a high impedance fault on said one or more electrical power conductors when any two of said individual high impedance fault detection systems each independently detect a high impedance fault~~ a microprocessor in which said composite high impedance fault detection system is implemented.

10. (Currently Amended): An apparatus for detecting a high impedance fault in electrical power lines comprising:

~~a wavelet based system having a first logical output for detecting a~~ said high impedance fault condition in said electrical power lines and having a first logical output;

~~a higher order statistics based system having a second logical output for detecting a~~ said high impedance fault condition in said electrical power lines and having a second logical output; and

~~a neural network based system having a third logical output for detecting a~~ said

high impedance fault condition in said electrical power lines and having a third logical output,

~~said wavelet based system, said higher order statistics based system and said neural network based system each independently detecting the same high impedance fault condition in said electrical power lines~~

a decision logic for determining whether said high impedance fault has occurred, wherein said decision logic determines that said high impedance fault has occurred if any two of said first logical output, said second logical output, and said third logical output indicate that said high impedance fault has occurred.

Claims 11 (Currently Amended): An apparatus for detecting a high impedance fault in electrical power lines comprising:

~~a plurality of high impedance fault detection means each having an output, each of said plurality of high impedance fault detection means independently detecting a high impedance fault condition on said electrical power lines; and~~

~~— a decision means for determining a high impedance fault if any two or more of said independent outputs are indicative that an associated one of said plurality of high fault detection means has detected a high impedance fault condition.~~

a composite high impedance fault detection system for connection to said electrical power lines for detecting said high impedance fault, said composite high impedance fault detection system comprising:

a plurality of high impedance fault detection systems operable to respectively make a plurality of independent determinations whether said high impedance fault has occurred and to respectively generate outputs representative of said independent determinations; and

decision means connected to said high impedance fault detection systems for determining whether said high impedance fault has occurred, said decision means determining that said high impedance fault has occurred if any two or more of said outputs indicate that said high impedance fault has occurred.

Claims 12 and 13 (Canceled).

Claim 14 (New). The method of claim 1, wherein the step of providing a plurality of high impedance fault detection means comprises providing a wavelet based system, a higher order statistics based system and a neural network based system.

Claim 15 (New). The method of claim 14, further comprising:

receiving an electrical signal from a sensing device coupled to said electrical power line;

filtering said electrical signal with a bandpass filter of 320 to 400 Hz;
and

inputting said filtered electrical signal into said wavelet based system, said higher order statistics based system and said neural network based system.

Claim 16 (New). The system of claim 5, wherein said plurality of high impedance fault detection systems are at least three and each of said outputs has one of first and second logic states, said first logic state indicating the presence of said high impedance fault and said second logic state indicating the absence of said high impedance fault; and

wherein said decision means determines that said high impedance fault has occurred if any two or more of said outputs have said first logic state.

Claim 17 (New). The system of claim 9, wherein said microprocessor also performs non-high impedance fault detection algorithms and control algorithms.

Claim 18 (New). The apparatus of claim 10, wherein the apparatus is a protective relay; and

wherein each of said first, second and third outputs each have one of first and second logic states, said first logic state indicating the presence of said high impedance fault and said second logic state indicating the absence of said high impedance fault; and

wherein said decision logic determines that said high impedance fault has

occurred if any two or more of said first, second and third outputs have first logic states.

Claim 19 (New). The apparatus of claim 18, further comprising a bandpass filter of 320 to 400 Hz for connection between said electrical power lines and said wavelet based system.

Claim 20 (New). The apparatus of claim 18, further comprising a microprocessor in which said wavelet based system, said higher order statistics based system and said neural network based system are implemented.

Claim 21 (New). The apparatus of claim 20, wherein said microprocessor also performs non-high impedance fault detection algorithms and control algorithms.

Claim 22 (New). The apparatus of claim 11, wherein said apparatus is a protective relay; and

wherein said plurality of high impedance fault detection systems are at least three and each of said outputs has one of first and second logic states, said first logic state indicating the presence of said high impedance fault and said second logic state indicating the absence of said high impedance fault; and

wherein said decision means determines that said high impedance fault has occurred if any two or more of said outputs have said first logic state.